DELTA STEWARDSHIP COUNCIL
A California State Agency

Executive Summary

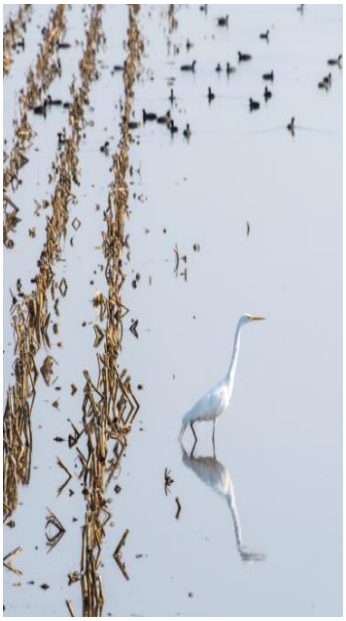
Funding Science to Meet Tomorrow's Challenges

Why this document?

At the 2017 State of the Estuary Conference in Oakland, a panel composed of leaders in Delta science and policy discussed the outcomes and lessons learned from the 2016 Science Enterprise Workshop.[1] The main topic of discussion was how to adequately fund science in the Delta to support robust decision-making. In response, the Delta Science Funding Initiative Workgroup (Workgroup) was launched to build on current efforts that promote coordinated science such as the Delta Science Plan, which established the vision of *One Delta, One Science*. The role of this collaborative Workgroup (see page 10 of the following paper for a list of participants) was to improve the tracking, support, and funding of Delta related science and ensure the development of action-oriented recommendations for implementation by decision-makers. This collaborative document represents support from the diverse membership of the Workgroup

What's next?

The Delta Plan Interagency Implementation Committee (DPIIC), whose members come together biannually to further the implementation of the State's Delta Plan, will consider endorsing this white paper at its spring 2019 meeting. Assuming endorsement, a workgroup will be created to develop a plan and schedule for implementation of these recommendations to be reviewed and adopted by DPIIC at its fall 2019 meeting, with implementation starting January 2020.



What's the nexus between this initiative and current calls for accelerated improvements to Delta science governance?

Running concurrently with this effort is a request from the Delta Independent Science Board (Delta ISB) to explore how to "accelerate efforts to address the rapidly growing and interlinked challenges for science-based policy and management decisions in the Delta…"and to "initiate and lead a bolder, forward-looking, and better integrated science and management program that provides policy-makers and managers with better scientific information and management options for the Delta." [2] Delta Stewardship Council staff is working with the Delta ISB and the DPIIC agencies to address this request and the recommendations included in the request.

[1] http://www.sfestuary.org/wp-content/uploads/2017/10/SOE17Oral21_FutureCal.pdf and http://deltacouncil.ca.gov/events/implementation-committee-event/science-enterprise-workshop

[2] http://deltacouncil.ca.gov/science-board/delta-isb-products

Issues, Findings, and Recommendations

Issue 1: Need for shared, rigorous mechanisms to critically assess science and monitoring efforts

Findings

1. Challenges estimating science-based expenditures

Recommendations

1.1 Establish common accounting and reporting protocols
1.2 Support the web-based tracking system identified in the Delta Science Plan
1.3 Coordinate a critical review of science funding in the Delta

Issue 2: Limited interchange among policy makers, scientists, and the public to inform science funding priorities and management questions

Findings

2.1 Limited communication to inform resource allocations
2.2 Unclear alignment of management needs and science linkages to support structured decision making
2.3 Limited guidance for compliance monitoring programs

Recommendations

2.1 Establish effective interchange between decision-makers, stakeholders, and scientists
2.2 Promote decision-support tools
2.3 Develop protocols to evaluate monitoring programs and the value of information generated

Issue 3: Need for consistent funding across the Delta science enterprise

Findings

3.1 Inconsistent and fragmented research efforts
3.2 Limited staff assigned to turn data into information
3.3 Information not sufficiently accessible or digestible by decision-makers and stakeholders

Recommendations

3.1 Develop topic-specific Delta science implementation plans
3.2 Secure additional sources of reliable funding to achieve Delta science needs
3.3 Support open science by implementing current road maps for collaborative and open data access, analysis, and synthesis
3.4 Support more user-friendly and timely information sharing

Funding Science to Meet Tomorrow's Challenges

A white paper for the Delta Plan Interagency Implementation Committee, prepared by the Delta Science Funding Initiative Workgroup[3]

Goal

An ongoing, consistent, relevant and reliably funded science enterprise providing useable information directly linked to critical management questions of a diverse set of stakeholders, federal and state agency managers, and scientists.

Problem Statement

The Sacramento-San Joaquin Delta (Delta) is a complex system and a critical linchpin of California's ecosystems, water supply, and economy. The region's ecosystem however, is in a highly altered and rapidly declining state. Climate change effects such as sea-level rise, prolonged drought, and increased flood risk are accelerating this change and complicating the management challenges. These factors have increased threats to reliable water deliveries for an expanding population, habitat for native species, and sustainability for Delta residents and communities. There is an acute sense of urgency to address these issues given the large-scale consequences of inaction.

Scientific information is a critical component of objective, effective, and defensible decision-making. Consequently, many environmental policies and regulations including the 2009 Delta Reform Act, federal and state endangered species acts, and state water quality control plans call for best available science to support management decisions. In the Delta, investments in science support a wide-range of required and non-regulatory activities and programs that have been well respected and widely recognized including the Interagency Ecological Program (IEP), Surface Water Ambient Monitoring Program, and Delta Regional Monitoring Program (Delta RMP). A wide variety of science activities are conducted including core monitoring, status and trends monitoring, targeted immediate and foundational research, modeling, and synthesis (see Key Terms). These activities range from those that directly support current management needs and those that provide key information on emerging issues that will have a bearing on decision-making in the long-term.

Despite the wealth of scientific information, the Delta's dynamic ecosystem is a moving target for natural resource management and environmental policy challenges of the region continue to resist a clear resolution. There is broad agreement "that society needs to do a better job of using scientific knowledge to guide conservation and resource management policies".[4] Three overarching issues contribute to this science-policy disconnect in the Delta:

1. **Need for shared, rigorous mechanisms to critically assess science and monitoring efforts**
2. **Limited interchange among policy makers, scientists, and the public to inform science funding priorities and management questions**
3. **Need for consistent funding across the Delta science enterprise**

[3] Please see pg. 10 for workgroup membership.

[4] Cloern, J and Hanak, E. 2013. It's time for bold new approaches to link Delta science and policymaking. San Francisco Estuary and Watershed Science. (11):3.

These three issues are not unique to the Delta and have been explored and debated in numerous venues including the 2016 Science Enterprise Workshop and panel discussions at Delta science conferences. The findings and recommendations in this document also expand upon the framework provided by the Delta Science Plan and support chapter 8 of the Delta Plan[5].

This document is a call for the agencies that sit on the Delta Plan Interagency Implementation Committee (DPIIC) and those in the wider Delta science community to act collectively upon these three issues. The findings and recommendations included here are not meant to be a panacea but are intended to spark dialogue and initiate efforts to strengthen the Delta science enterprise so that we can better manage such a dynamic and multi-faceted system. Although the focus of this document is on addressing immediate issues for funding Delta science, science governance and management activities must be considered in coordination with upper watershed and Bay efforts.

Key Terms

Core monitoring: Monitoring that provides information on a seasonal and daily basis to inform specific decisions on operations for water supply and fish species status. Core monitoring is conducted almost entirely to fulfill requirements for regulatory compliance.

Data: Recorded symbols (e.g. words, numbers, and images) and sensory readings that capture a set of facts about an event. Examples include measures of precipitation, flow, and population abundance. (http://www.tlainc.com/articl134.htm)

Information: A message with relevant meaning used to make decisions or solve a problem (e.g. synthesis report, model output). Information can come from processed data but can also come from other forms of communication (e.g. instructions). (http://www.tlainc.com/articl134.htm)

Open science: The practice of making scientific data and information publically available and accessible.

Status and trends monitoring: Monitoring that contributes to long-term datasets used to compare environmental conditions (e.g. species populations, water quality) over time. Information improves system understanding and can be applicable to a variety of management decisions rather than a specific action. Status and trends monitoring is primarily required for regulatory compliance, although it may also be associated with non-regulatory efforts.

Science enterprise: The broad collection of science programs and activities that exist to serve managers and stakeholders in a regional system. This includes agency science programs, academics, NGOs, and the private sector.

Synthesis: The combining of diverse information from multiple sources into one concept, model, finding, or report.

Targeted foundational research: Science efforts that provides the knowledge and context to inform long-term management and policymaking, while also identifying and understanding emerging issues so that natural resource managers can be better prepared for future challenges. This is not typically supported by funds allocated for science efforts linked to regulatory requirements.

Targeted immediate research: Science efforts that answer current management questions by providing evidence to support or refute hypotheses. This is not typically supported by funds allocated for science efforts linked to regulatory requirements.

[5] Chapter 8: Funding Principles to Support the Coequal Goals.

The following is a description of the issues, the findings that led to the identification of these issues, and recommendations regarding how to address these issues. Please note that all of the findings and recommendations are interconnected and could be addressed in multiple issue areas.

Issues and Recommendations

Issue 1. Need for shared, rigorous mechanisms to critically assess science and monitoring efforts

Currently, science funding is dispersed across various agencies that use different accounting protocols with different fiscal years. This impedes efforts to consolidate and evaluate funding across the system. For example, there is no common set of funding categories (e.g. core monitoring, status and trends, targeted research), itemization protocols (e.g. staff salaries, instrument purchase and maintenance) or strategies to evaluate State and federal agency expenditures.

Finding

1.1 Challenges estimating science-based expenditures. The disparity in accounting methods along with obstacles to accessing budgetary values makes estimating spending across organizations difficult. Consequently, there is concern that no clear linkages exist between expenditures and science actions to inform critical management questions. These factors hinder more efficient resource allocation and the development of clear justifications when prioritizing or proposing funding increases.

Recommendations

1.1 Establish common accounting and reporting protocols. Develop a common accounting template based on ongoing efforts.[6] Such an effort would allow for transparent and accurate characterization of science funding sources (e.g. general funds, funds reimbursed through water rates). Strategies should address how to standardize accounting and reporting across federal, State, and local agency budgets. This effort should support actions in recommendation 2.4 and include annual reporting of Delta science investments allowing for 1) effective tracking of science funding and 2) awareness of how different levels of funding impact scientific understanding and policy decisions. Both the Chesapeake Bay Restoration Program and the South Florida Ecosystem Restoration Program provide examples of existing cross-cut budgets.

1.2 Support the web-based tracking system identified in the Delta Science Plan. The science tracker identified in Delta Science Plan[7] can provide a mechanism to efficiently, accurately, and transparently assess financial investments and science activities in the Delta. The tracking tool could use the budget template described above and will catalog information.

1.3 Coordinate a critical review of science funding in the Delta. In order to adaptively manage the Delta science enterprise, an outside review of science funding should be conducted to highlight opportunities to increase efficiency, reduce redundancies, and clarify accounting. Given the

[6] In December 2018, the U.S. Bureau of Reclamation (Reclamation) and the Department of Water Resources (DWR) signed a Memorandum of Agreement (BOCT Agreement) to specifically identify funding and track costs for the joint and individual requirements for DWR and Reclamation that are set-forth by the 2008 U.S. Fish Wildlife Service 2008 Biological Opinion (BiOp) and the 2009 National Marine Fisheries Service 2009 BiOp. These agencies also agreed to use standardized accounting methods and to report this financial data by December 31 of each year. The BOCT agreement provides a standardized accounting method and reporting protocol that could be used for this effort.

[7] 2019 Delta Science Plan action 5.3.

number of State, federal, and other funders, and the complexity of the Delta science enterprise, an independent review could provide valuable insight into the enterprise's efforts.

Issue 2. Limited interchange among policy makers, scientists, and the public to inform science funding priorities and management questions

In the past decade, several venues have emerged including the Collaborative Science and Adaptive Management Program/Collaborative Adaptive Management Team (CSAMP/CAMT), Delta RMP, DPIIC, and the Delta nutrient research plan work groups, where decision-makers, scientists, and stakeholders can collaboratively identify management priorities and discuss research and monitoring efforts to address these needs. These more recent science management venues add to longer-standing collaborative groups such as the IEP. Shared science priorities are exhibited in collaborative documents such as the Science Action Agenda (SAA), the IEP Science Strategy, and Delta RMP and IEP work plans. However, there are few opportunities for discussion across these coordinated efforts. This results in a lack of consistent understanding among decision-makers, scientists, and stakeholders of management priorities and how coordinated science efforts link to and support them.

Findings

2.1 Limited communication to inform resource allocations. Leaders of public agencies and stakeholder organizations often express frustration that they are presented with multiple requests for funds to support scientific activities but do not have enough information to prioritize them. This can result in redundant efforts or missed opportunities due to the lack of information to justify expenditures.

2.2 Unclear alignment of management needs and science linkages to support structured decision making.[8] Existing efforts lead by CSAMP/CAMT and the Delta Stewardship Council are applying structured decision making approaches; however, there are still limited opportunities for interchange among scientists, decision-makers, and stakeholders where research results and their implications for management are conveyed and management decisions and priorities are articulated to guide science actions. These exchanges are critical elements of structured decision making. The lack of communication can result in different expectations about the extent to which research outcomes can inform management decisions, creating tensions among interest groups.

2.3 Limited guidance for compliance monitoring programs. Most monitoring programs in the Delta have been established to inform regulatory processes. Many of these programs have been in place for decades and collect large amounts of data to inform the ecological health of the Bay-Delta Estuary. However, there are no established processes to evaluate the information generated from these efforts and whether they satisfy current informational needs. There is also limited stakeholder engagement for scientific tracking at the program-level. These issues, combined with challenges for the timely dissemination of information, have contributed to a lack of trust and understanding of the value of these monitoring programs.

Recommendations

2.1 Establish effective interchange between decision-makers, stakeholders, and scientists. Utilize existing groups such as the DPIIC, CSAMP/CAMT, and IEP, to increase solution-oriented dialogue among decision-makers, stakeholders, and scientists. Discussions should include sharing

[8]Structured decision-making is a widely recognized approach for objectively addressing natural resource management issues involving diverse stakeholder groups and competing objectives.

information and identifying opportunities to coordinate across venues. Key to effective interactions is the use of information that is digestible by a wide audience (e.g. data visualization). Use concepts and tools identified in the Delta Science Plan such as the policy-science forum approach[9] and SAA to identify shared and conflicting priorities. Increasing opportunities for two-way dialogue between scientists and decision-makers and stakeholders will help develop trust, strengthen linkages between management needs and current research, identify knowledge gaps, increase appreciation for the time it takes to address uncertainty and the effects of management actions on a complex ecosystem, and reduce redundancies.

2.2 Promote decision-support tools. Support integrated modeling and structured decision making including the Integrated Modeling Steering Committee efforts in developing a strategy to better integrate physical, biological, and conceptual models of the Delta to support decision-making. Examples of existing efforts to integrate mechanistic and conceptual models include the salmon life cycle model,[10] and current efforts surrounding model integration for Delta smelt and reoperation of the Suisun Marsh salinity control gates.[11]

2.3 Develop protocols to evaluate monitoring programs and the value of information generated. Establish a workgroup composed of State and federal agencies and stakeholders involved in monitoring activities to evaluate current monitoring efforts. Workgroup members should be individuals with authority to provide regulatory direction, have in-depth understanding of the monitoring programs, and knowledge of financial expenditures. These include senior scientists, contract managers, and executive leaders. The upcoming Delta Independent Science Board's reviews of both the Delta monitoring enterprise and IEP governance structure will provide recommendations for improving current monitoring efforts. Program assessments should include identification of management needs, how monitoring activities align with current management needs, how they can be more effective, and opportunities to leverage investments to better support ongoing management decisions. Information exchange should occur on an annual basis at dedicated venues (e.g. annual workshop, an IEP stakeholder project work team meeting).

Issue 3. Need for consistent funding across the Delta science enterprise

Although science-based expenditures in the Delta over the past 10 years total nearly $1 billion, the Workgroup found that overall expenditures in the Delta are notably less than other similar large-scale ecological efforts.[12] Public funding for non-regulatory science activities in the Delta from both State and federal sources fall short in comparison to ecological systems with similar economic outputs.[13] In addition, the majority of the funding for science comes from DWR and the US Bureau of Reclamation,[14] but statutory authorities limit expenditures to core monitoring, status and trends monitoring, and some

[9] See 2019 Delta Science Plan Chapter 2. Policy-Science Forums offer deliberate and direct dialogue among scientists, decision-makers, and stakeholders. The objectives of Policy-Science Forums are to identify scientific uncertainties, clearly define priority management questions, and facilitate exchange among different programs and entities.

[10] https://www.nwfsc.noaa.gov/research/divisions/cb/mathbio/lifecycle.cfm

[11] https://water.ca.gov/-/media/DWR-Website/Web-Pages/Programs/Environmental-Services/Interagency-Adaptive-Management-Program/Suisun-Marsh-Salinity-Control-Gates-Action-Pilot-Study.pdf?la=en&hash=18090ADA6265D529CA1981E3A05B3FD024893984

[12] Tennefoss, Aston. 2018. Shared Science for the Sacramento-San Joaquin Delta. Practicum Report.

[13] San Francisco Bay Delta Watershed: Wide Range of Restoration Efforts Need Updated Federal Reporting and Coordination Roles (GAO-18-473)

[14] Funded largely in part through public water agencies.

targeted research. While some funds for targeted research have been made available, these funds have been primarily in the form of voter-approved State bonds (e.g. Prop 1), which are sporadic. Large-scale joint solicitations supporting a broad call for research proposals have only occurred once –the 2018 joint Proposal Solicitation Notice[15] (PSN) between the Delta Science Program and Department of Fish and Wildlife, with support from the US Bureau of Reclamation.

Findings

3.1 Inconsistent and fragmented research efforts. Current targeted research funding typically supports limited-term contracts or grants, resulting in research efforts that only last a few years at a time. Most of this research focuses on one species or stressor, with little coordination across efforts or research focused on larger ecosystem interactions. This, and the lack of dedicated resources for synthesizing available information, prevents a comprehensive understanding of the ecosystem. While support for some long-term research exists, data for many current stressors (e.g. harmful algal blooms, invasive plants) lack long-term data. The current monitoring approach in addressing these stressors is opportunistic, leaving gaps in data and knowledge. There are additional opportunities to coordinate research with existing long-term monitoring efforts.

3.2 Limited staff assigned to turn data into information. Monitoring and research programs are limited in both staff and technological capacity to continuously process and analyze the vast amount of data collected, resulting in lack of valuable information for decision making. Current synthesis efforts, such as the IEP synthesis teams and Delta Nutrient Research Plan science workgroups, continue to be *ad hoc* in nature, while the number of positions dedicated to synthesis are inadequate for the scale or frequency of synthesis needed to provide useable and actionable information.[16] It should also be noted that some agencies have experienced difficulty in filling positions; filling positions should be prioritized over creating new positions.

3.3 Information not sufficiently accessible or digestible by decision-makers and stakeholders. Many scientific articles and synthesis reports are too detailed and lengthy to be useful to decision-makers and the public. Information dissemination can be delayed by the publication process for scientific peer-review, and once published, many journal articles are not freely accessible nor easy to find. Passage of Assembly Bill 1755, or the Open and Transparent Water Data Act, will facilitate data accessibility across multiple platforms; however, reluctance to share data, combined with barriers to process data and release information in a timely manner, continues to leave potentially invaluable discoveries hidden in routinely collected data.

Recommendations

3.1 Develop topic-specific Delta science implementation plans. [17] Utilize existing organizations such as CSAMP, IEP, and the Regional Monitoring Programs (RMPs) to develop coordinated study plans. These plans should clearly articulate management issues that will benefit from the science, the expected value of new scientific information, the practical approach to obtain it, and existing funding sources and science funding needs. The 2017-2021 SAA and IEP science strategy can be used as a starting point to identify priority management topics and associated

[15] http://deltacouncil.ca.gov/science-program/delta-science-proposal-solicitation-0

[16] Discussed in The *Future of the IEP: Adapting to New and Emerging Needs – Addressing Key Areas. Discussion Document for IEP Directors Meeting, October 19, 2010*

[17] See Delta Science Plan Chapter 5 for more information.

science actions. The draft Delta Smelt Science Plan (CSAMP/CAMT) and Central Valley Regional Board's Nutrient Research Plan provide recent examples of topic-specific plans.

3.2 Secure additional sources of reliable funding to achieve Delta science needs. Utilize existing collaborative groups such as CSAMP/CAMT and IEP to address science funding and establish new forums if needed. Participants must include individuals with financial decision-making authority, in-depth understanding of accounting, lead scientists from federal and State agencies, and stakeholders who participate in and/or support science activities in the Delta. Frequent interchange among stakeholders, scientists, and managers and coordination among the different groups will be critical (see recommendations 2.1 and 2.2). Outcomes of these discussions should address how to coordinate and set funding priorities, identify resources (including support for new positions), and avenues to reallocate or leverage current funding (e.g. modernizing technology, eliminating redundancies). The topic-specific science implementation plans described above, the IEP Science Strategy, and the SAA can be used to guide funding priorities.

3.3 Support open science by implementing current road maps for collaborative and open data access, analysis, and synthesis. Support current efforts including the IEP Data Utilization Workgroup and California Water Quality Monitoring Council Data Management Workgroup, which provide support for data standardization, sharing, and conduct data needs assessments. Build on existing open science data repositories and sharing opportunities.[18] Require research supported by public funds to submit results to a shared data repository. [19] Building on existing IEP efforts,[20] create "synthesis steering teams" that have the authority to identify priority topics to marshal resources (staff and funding) and to make science accessible to decision-makers. Collaborate with external synthesis centers like the National Center for Ecological Analysis and Synthesis[21] that curate datasets for large-scale synthesis efforts.

3.4 Support more user-friendly and timely information sharing. Establish a team of experts in science communication to develop guidelines to disseminate technical information to decision-makers, stakeholders, and the public. Communication tools include data visualization, summary papers, and web portals (e.g. Bay Delta Live, EcoAtlas). Guidelines should include strategies to increase communication of preliminary scientific information (e.g. workshop presentations, meeting briefs). Public data repositories and a Delta science tracker (see recommendation 1.2) can also improve transparency and accessibility.

Conclusions and Next Steps

The future of the Estuary, its residents, and California's critical water resources depend on clear answers to questions that can only be addressed by strategic and adequately funded scientific research. Until we critically assess research and monitoring needs and consistently and robustly support science, finding these answers will continue to be challenging.

[18] An example is the Environmental Data Initiative https://environmentaldatainitiative.org/

[19] USGS and NOAA have open data portals and science practice requirements that could serve as models.

[20] For example, the IEP Synthesis Framework

[21] https://www.nceas.ucsb.edu/

The recommendations provided here outline a path towards achieving this goal within the Delta but additional challenges remain. Although the white paper does not directly address governance issues, governance and funding issues are deeply intertwined. Ensuring a well-funded science enterprise that provides information linked to critical management questions will require effective science governance, including strong leadership and collective efforts to develop an "effective structure for creative scientific and technical integration".[22] In addition, we acknowledge that the Delta is integrally connected to the San Francisco Bay and upstream watersheds. Attempts to link research and monitoring programs across these regions will require substantial support but will result in improved management responses to climate change and other growing challenges. Efforts that further address these two issues include implementation of the Delta Science Plan and actions to address recommendations from the Delta Independent Science Board (see footnote 21).

[22] http://deltacouncil.ca.gov/sites/default/files/2019/02/2018-2-14-FINAL-ISB-DPIIC-Letter-20190211.pdf

Collaborative efforts in other systems

Below are examples of collaborative science and management efforts both in California and in other areas in the United States. Although every program has its strengths and weaknesses, each region has taken on innovative approaches to leveraging resources for science activities and governance structures to ensure transparency, inclusion from a wide range of stakeholders, and coordinated efforts.

Southern California Coastal Water Research Project

Originally a joint powers authority supported by Southern California's wastewater agencies, the Southern California Coastal Water Research Project (SCCWRP) has grown to include 14 member agencies spanning wastewater, storm water, and water quality regulatory entities in California. A Commission composed of the 14 member agencies oversee the research portfolio at SCCWRP to maintain relevancy of this science to management needs. They hold public meetings and work together to develop a comprehensive, independent research plan that includes "long-term research and broadly supported priorities for SCCWRP's future research directions".

The Great Lakes Observing System

Part of the 11 regional associations of the Integrated Ocean Observing System, the Great Lakes Observing System (GLOS) is an example of a data collection, management, and sharing effort involving international, federal, regional, academic, and private sector participants. The GLOS has lead the "integration of interoperable, easy to access data, products, and related services" among bi-national partners to provide stakeholders and decision-makers with real-time, management relevant information about the Great Lakes. In 2016, the GLOS collaboratively developed a strategy with recommendations for actions and investments over the next five years to further develop and expand the data collection network and build upon existing private-public partnerships.

The Chesapeake Bay Program

The Chesapeake Bay Program is recognized as a clearly organized restoration program with strong partnerships among federal, state, and local governments as well as non-profit organizations and academic institutions. The Program includes several programs and teams including a Modeling Workgroup focusing on integrated modeling supported by the wider science community, a Communications Workgroup to support outreach and communication among the different Program partners, and a Budget and Finance Workgroup.

Missouri River Recovery Program

The program implements management actions that are necessary to comply with the Endangered Species Act by avoiding a finding of jeopardy to three federally listed species on the Missouri River. Planning follows implementation directions in a comprehensive Science and Adaptive Management Plan and employs a standing Independent Scientific Advisory Panel to assure the best available science is used to develop alternatives and evaluate the effects of those alternatives on environmental resources and the human uses of the river. Funding mostly through federal appropriations to the Army Corps of Engineers is allocated to staff support and governance, management actions implemented in an adaptive framework, and a research, modeling, and monitoring program explicitly directed to inform and guide management decisions by evaluating management-relevant hypotheses and confronting key ecological uncertainties.

List of Acronyms

CAMT: Collaborative Adaptive Management Team
CSAMP: Collaborative Science and Adaptive Management Program
DASW: Delta Agency Science Workgroup
DPIIC: Delta Plan Interagency Implementation Committee
IEP: Interagency Ecological Program
RMP: Regional Monitoring Program
SAA: Science Action Agenda

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